The Impact of Information and Communication Technology on the Land Use and Planning Rates of Government Administrative Services

Hadeel Mahmoud[1,2,*], Noha Nabil[1], Mohamed Ahmed Reyad[1]

• **Abstract**— The evolution of government administrative services is strongly influenced by information and communication technologies (ICT). The purpose of this study is to investigate the effect of Information and Communication Technology on government administrative services by exploring an international experience in integrating ICT into the government sector. Land use and planning rates are two major aspects that have affected the development of government administrative services, and they have been examined using Denmark as a case study. The research found that Communication and information technology had an impact on Denmark's plans where the percentage of government services reduced by roughly 4% from 2001 to 2017. It was also observed that the country's rates of planning government services were lower than the world average due to the integration of communications and information technology ; nevertheless, service efficiency remained unaffected.

Index Terms— Administrative Service, Information and Communication Technology, Planning Rates, Land Use, Denmark, Digital Services, Urban Planning.

1 Introduction

Most governments throughout the world have established advanced ICT-enabled infrastructure for service delivery and governance.[1] Just like industrial development completely changed the spatial structure of cities in the agricultural society, the progress of ICT is the key element of the transformation of modern cities. These technological developments have affected the city and the activities that take place within it.[2]

Government administrative services are also experiencing substantial changes in the twenty-first century, particularly in advanced economies, as a result of the vital role that ICT plays in delivering and updating administrative services in many countries. Therefore, the impact of ICT on government administrative services has to be evaluated as it is directly connected to public needs, particularly in the land use changes and planning rate.[3]

Despite the importance of ICT in providing government administrative services, no planning rates for these services have been developed to keep up with this progress, and the impact of technology on land use growth has not been identified.

Therefore, the research answers two specific questions. First, what is the effect of ICT on government administrative services? Second, what can be obtained from the impact of ICT on land usage in the service sector's development?

This paper illustrates the development of government administrative services via the use of ICT in providing services to citizens. In particular, the main objective of the study is to especially shed light on: (i) the relationship between ICT and the development of Government administrative services rates; and (ii) the interaction between ICT and land use.

2 Classification and Rates of Administrative Services

Administrative services vary from country to country in terms of content. As some countries consider public utilities such as water, electricity and other services to be separate from administrative services, while other countries consider fire-fighting and police services to be unrelated to administrative services, and thus the components of administrative services differ from one country to another. Therefore, after an analysis from numerous nations, a complete classification of administrative services was produced as follows:

- **Utility Services:** include infrastructure institutions such as water, electricity and communications, also energy organization, roads and transport authority and various railway public services.
- **Public Safety Services:** which are police stations, National Defense, Military Facility and Civil Defense.
- **Government Services:** such as post officess, Municipal Buildings, Passport offices, traffic offices, local government units, city hall, customs agency and regional administrative units.
- **Special Services:** like The Parlament, Ministries, Embassies, Courts, banks and Governor's Palace.[4]

In view of the planning rates, they are used to specify characteristic and size of services. Therefore, the planning rates for administrative services in different countries are studied in table no.(1), to identify the approximate global average for the planning rates of government administrative services.

[1] Architecture Engineering Department, Faculty of Engineering - Mattaria, Helwan University, Cairo, Egypt
[2] Architecture Engineering Department, Higher Institute of Engineering and Technology, Fifth Settlement, Cairo, Egypt
*Corresponding author: E–mail address: eng.hadeel.m@hotmail.com

Table no. (1): The Planning Rates of Administrative Services in various cities.

Cities of Study	Service Type	Schematic level					
		District			City		
		Inhabitant Number (thousands)	Per Capita Site Share (m²/person	%	Inhabitant Number (thousands)	Per Capita Site Share m²/person	%
China	Utility Service	100 -200	0.1	12	200-660	0.3	17
	Public Safety Service		0.27	31		0.28	18
	Gov. Service		0.38	43		0.67	45
	Special Service		0.13	14		0.31	31
India	Utility Service	40 -90	0.08	9	10000 - 80000	0.3	16
	Public Safety Service		0.3	32		0.32	17
	Gov. Service		0.4	43		0.78	42
	Special Service		0.16	17		0.45	24
South Africa	Utility Service	11 -60	0.1	12	60 -1000	0.2	12
	Public Safety Service		0.27	31		0.25	16
	Gov. Service		0.38	43		0.75	48
	Special Service		0.13	14		0.39	24
Dubai	Utility Service	20 -30	0.09	16	50 - 200	0.25	19
	Public Safety Service		0.15	26		0.2	14
	Gov. Service		0.22	38		0.63	46
	Special Service		0.12	21		0.28	21
Average of Gov. Service Rates		District level: 0.22 – 0.4			City Level: 0.63 – 0.78		

Source: created by the author from [5], [6], [7], [8].

In the preceding table, we finished by monitoring the planning rates for administrative services in various cities, and the following observations were obtained:

- The per capita share of administrative services at the city level is larger than its share at the district level, due to the concentration of a large amount of administrative service buildings at the higher level.
- Government services are recognized to be the most essential administrative services in the different nations, since in most nations they are considered to be the highest rates of their administrative services, and their percentages is approximated by 50% in general administrative services.
- Government services were chosen as a powerful administrative service model to clarify the implications of communications and information technology on land use or its planning rates.

3. A Case Study of Digital Transformation of Danish government Services

Denmark has been the leading European and world country regarding digitalization of public services for the last several years.[9] Denmark is among the most digital countries in EU. 94% of Danish citizens are online and actively engaged in the use of a variety of online services, making their digital skills highly advanced.[10]

In addition, most transactions are cashless, and almost all interaction with the Danish authorities takes place online. Almost every agency or public official can be reached online, and each citizen has a specific digital signature to "sign" important documents.[11]

3.1 Classification of Administrative Services in Denmark

In principle, this main group consists of activities which are public by nature, i.e. activities which cannot be carried out by private individuals or enterprises. It includes the legislative branch, local authorities, local and general enforcement agencies, general financial policies and agencies pertaining thereto, general public personnel policies, centralised purchasing and sales, international relations, police activity, and defence.[12]

In addition to that, there are courts, military installations and the Danish Parliament, as well as administrative office buildings for ministries and local units that provide all public services to citizens,[13] and below there is a general classification of the Administrative Servise in Denmark as shown in figure (1).

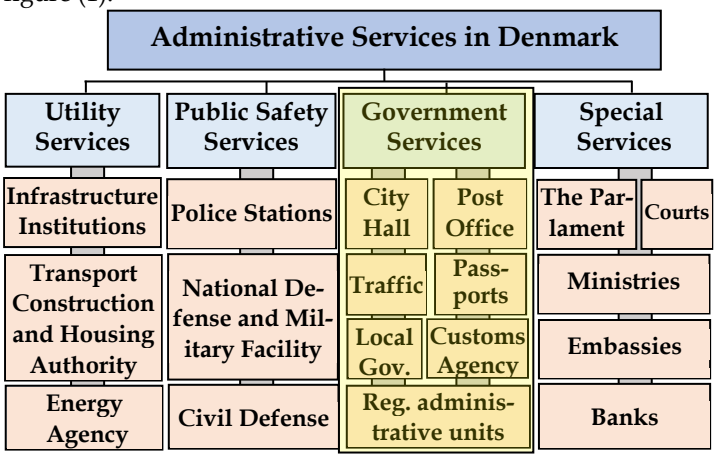

Fig. 1: Classification of Administrative Services in Denmark, Source: created by the author.

3.2 The impact of ICT on the planning of government administrative services in Denmark

The impact of ICT on the planning of administrative services in general, and government services in particular, can be divided into four categories:

1- **Establish New Institutions:**

- Four decentralized service centers for various services were set up in 2004. In addition, over 30 citizen services

were made accessible via the internet at that time.

• An independence agency was established to assist local governments with computing and development services.

• Information Technology led to the establishment of Occupations and Government Institutions, which operated independently, but the government combined them into one institution.[6]

2- Organization and distribution of activities:

• A single office was created in order to address all citizens' needs with the implementation of the front services.

• The administrative services organization has changed from a centralised to a decentralised way, whereby several jobs have been distributed to local administrations along with digital services.

• The bulk of government workers will continue to be located in central places like the statehouse (central governmental buildings), the County hall of administration and the city hall. Some will be decentralized to distributed work places such as regional offices, metropolitan subcentres, and little city halls. Others will work at home with a link to the office via the computer and telecommunications.

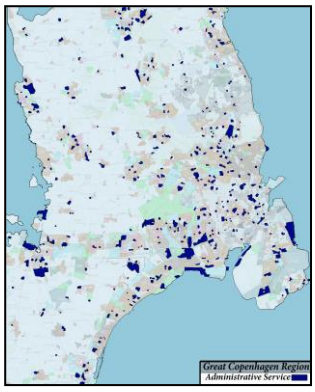

Fig. 2: Current Administrative Service distribution in Great Copenhagen, Source: http://kort.plandata.dk/spatialmap Access: 2/6/2021.

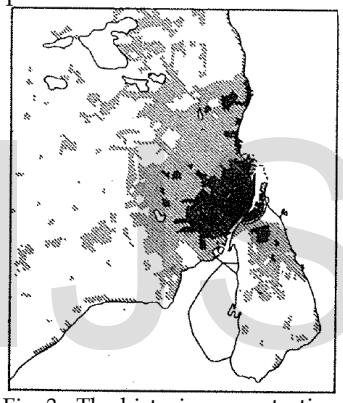

Fig. 3: The historic concentration of services in the city centre, Source: The Regional Planning Office, "Skitseforslag til Engsplan for Storkobenhave", The Danish town planning laboratory, Copenhagen, 1993, P.25.

3- Aleration of work processes:

• Although the possible changes are many, three are especially important: sophisticated coordination and optimization, automation of direct services to citizens and electronic communication with citizens.

• Coordination and optimization refer to the ability of government organizations in distant places to coordinate and optimise their work in terms of of a follow order.

• The term "automation of service delivery" refers to the totally computerised management of information or service requests, i.e., automated access for citizens to government administrative services as shown in figure (4).

4- Nature of the work:

• New information technologies are changing the nature of work in local governments, as it appears that increasing the digitization of work processes results in many changes, including: acceleration of work at all levels of government, tighter coupling to work, especially when individuals from multiple departments are connected. And, when the various government jobs are combined, professional workers and workers will have more independence.

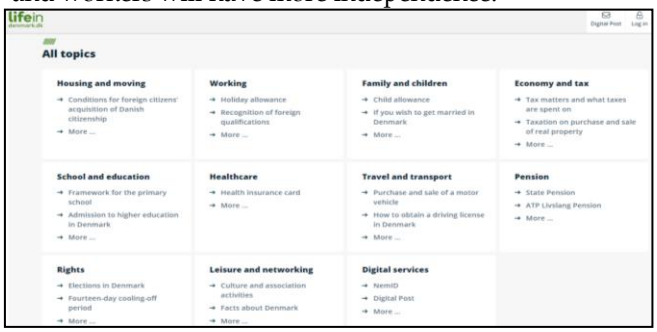

Fig.4: Most services are accessible from one site, Source: https://lifeindenmark.borger.dk/ Access:1/6/2021.

• Highly professional and specialised workgroups such as engineers, planners, economists, statisticians, management analysts, and staff analysts appear to be more independent as a result of information technology.[7]

• A mandatory digital geographic plan register was established called "PlansystemDK" and is accessible to the public. Also, over the course of several law amendments, more details were added to the database.[8]

The previous section focused on the effects of information and communication technology on the planning of administrative services in general, and government services in particular, and the following is the table no.(1) which tracks how much information and communication technology affects the land use of administrative services.

Table no. 1: The Impact of ICT on land use.

Land use cases	Strong	Moderate	Weak	Notes
Land use overlaps	■			- Single office for all services. - Work from home. - Citizen accessing service from home.
Reduced intensity of uses	■			-Decentralized service centres that provide a wide range of services. - Single office for all services.
Land use ratios and rates	■			With a reduction in the intensity of uses and the ability to access services from home, the percentages and rates decline.
Service sites	■			Decentralization has been applied in many sectors of city services
New patterns of land uses	■			-New government positions and institutions have been established. -Create decentralised service hubs.
Geographical location freedom	■			- Work from home. -Citizens' access to the service at any time and from anyplace.

Source: created by the author.

3.3 Planning rates of government administrative services in Copenhagen

As a result of what was previously presented about administrative services in Denmark and the extent to which information and communication technology affects government administrative services, either at the level of service planning or service management itself.

Based on that, the impact of technology was seen in service planning rates as well, with the area given to administrative services in the Copenhagen Plan in 2001 being over 14%, but when the plans were updated in 2017, this proportion was only about 10%.[8]

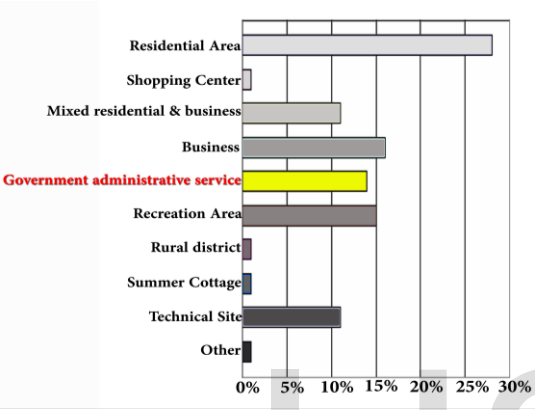

Fig. 4: Government Administrative Services Percent in 2011, Source: Spatial Planning Department, "Spatial Planning in Denmark", Ministry of the Environment, Copenhagen, 2012, P.19.

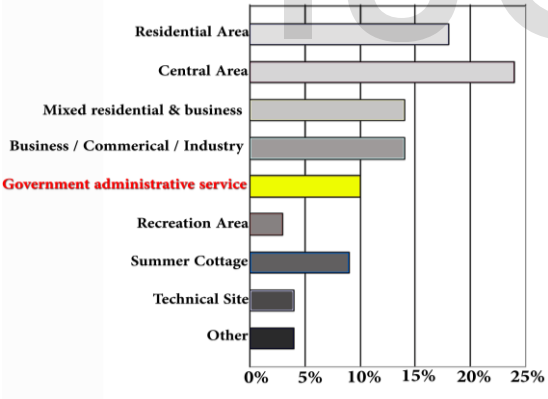

Fig. 5: Government Administrative Services Percent in 2017, Source: Fertner, C., & Others, "Emerging digital plan data – new research perspectives on planning practice and evaluation", Geografisk Tidsskrift-Danish Journal of Geography, Denmark, 2018, P.5.

The planning rates for administrative government services in Copenhagen are as shown in table no.(2) {The area of the sites was estimated by the researcher using the Google Earth Pro programme):

Table no. 2: The planning rates for government administrative services in Copenhagen

Service Type	Schematic level	Inhabitant Number (thousands)	Area of Site (m^2)	Per Capita Site Share (m^2/person)
Citizens Service Center	District	50 -100	The service is available as part of a cultural building or within several administrative buildings	-
Post Offices			The service is available as part of mall or residential building	-
At this level, there is no specific planning rate for government administrative services.				
City Hall	City	638.117	19475	0.03
National Archives Center			2100	0.01
Regional Government Office			12234	0.02
Central Citizen Service Center			5542	0.01
International Citizen Service			1350	0.002
government departments			191435	0.3
Traffic Center			12700	0.02
Central Post Office			11850	0.02
City-level administrative service rates 0.41 m^2/person				

Source: created by the author.

In the last table we end by observing the planning rates for the government administrative services in Copenhagen:

- The planning rate in the country was influenced by the integration of communications and information technology in the sector of government services, as determined by the previous study, which indicated that it was less than the world average.
- There is no physical presence of Government Services at the neighbourhood level, with the exception of postal services, which are placed in the form of automated teller machines.
- As a result of ICT, there are no government services at the district level with distinct buildings; instead, they are part of a group of other administrative buildings or spaces within various buildings.
- Most government services are provided through various buildings at city level, as they don't have to be delivered at lower levels because they can be provided through citizen service centres, where most government services can be

found as a result of the digitization of the public sector and the transformation of those services into electronic services.

4.CONCLUSIONS:

The study analyzed the impact of information and communication technology on government administrative services. Land uses and planning rates are two important factors on which the impact of communication and information technology has appeared and has been analyzed through the case study of Denmark, and the findings can be concluded as follow:

- The city's distribution of government services has transformed from centralised to decentralized, since there is no concentration of government services in one section of the city, rather they are spreading throughout the city as a result of the city's growth of ICT.
- It was discovered that there is a strong link between information and communication technology and the land uses of government services, as evidenced by Land use overlaps, reduced intensity of uses, land use ratios and rates, service sites, new land use patterns, and geographic location freedom.
- Communication and information technology had an impact on Denmark's plans, as seen by the reduction of the percentage of government services when comparing the creation of plans from 2011 to 2017, as seen the percentage reduced by roughly 4%.
- Land use impacts may be taken advantage of by delivering better, more, and faster services at a reduced cost.
- The country's rates of planning government services were impacted by the integration of communications and information technology, becoming lower than the world average; nevertheless, service efficiency remained unaffected.

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